

R1 = H or one of the following:  
β-O Linked to the 1, 2, 3, 4, or 6 position of  
the adjacent monosaccharide or a linear or  
branched polysaccharide.

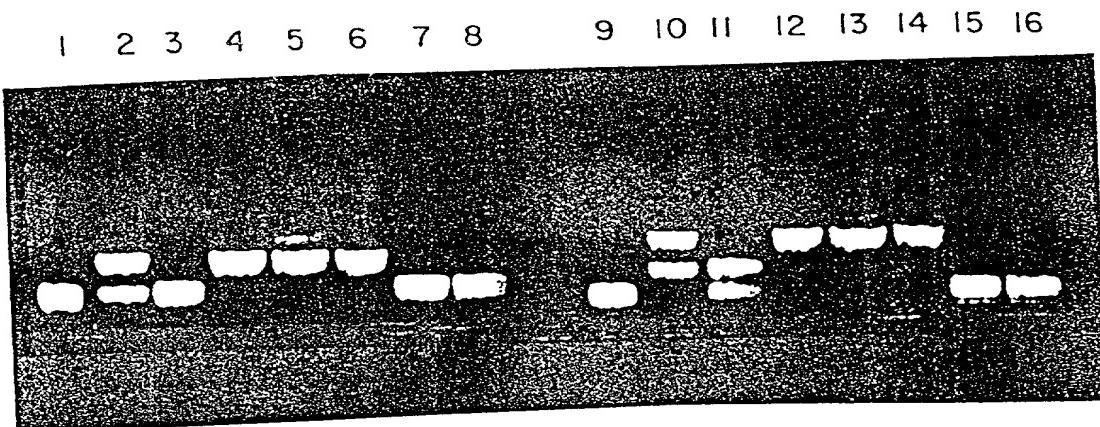
R2 = H or one of the following:  
α-O Linked to the 1, 2, 3, 4, or 6 position of  
the adjacent monosaccharide or a Linear or  
branched polysaccharide.

R2-10 = H or one of the following: OH, SO<sub>3</sub>, phosphate, NH<sub>2</sub>NHAc, OCH<sub>3</sub>, O-alkyl, CH<sub>3</sub>, CH-alkyl, or inorganic-alkyl; O linked to another R2-10 within the same monosaccharide.

FIG. I

113 :  $\text{Gal}\beta 1\text{-}3\text{G}1\text{cNAc}\beta 1\text{-}3\text{Ga}1\beta 1\text{-}4\text{G}1\text{c-Co}$   
           /  
           Fuc $\alpha 1\text{-}4$

167 :  $\text{Gal}\beta 1\text{-}3\text{G}1\text{cNAc}\beta 1\text{-}3\text{Ga}1\beta 1\text{-}4\text{G}1\text{c-Co}$



#### Substrate 113

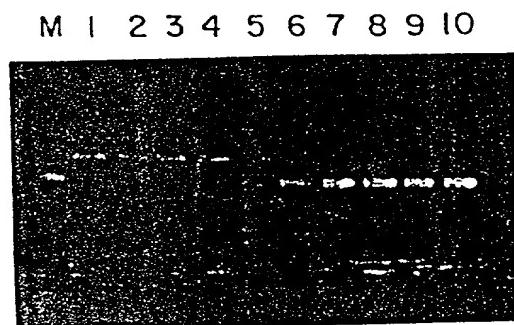
1	+	no preparation
2	+	<u>X. holcicola</u> preparation
3	+	<u>X. badrii</u> preparation
4	+	<u>X. manihotis</u> preparation
5	+	<u>X. cyanopsisidis</u> preparation
6	+	<u>X. oryzae</u> preparation
7	+	<u>X. campestris</u> preparation
8	+	<u>X. campestris</u> preparation

#### Substrate 157

9	+	no preparation
10	+	<u>X. holcicola</u> preparation
11	+	<u>X. badrii</u> preparation
12	+	<u>X. manihotis</u> preparation
13	+	<u>X. cyanopsisidis</u> preparation
14	+	<u>X. oryzae</u> preparation
15	+	<u>X. campestris</u> preparation
16	+	<u>X. campestris</u> preparation

FIG. 2

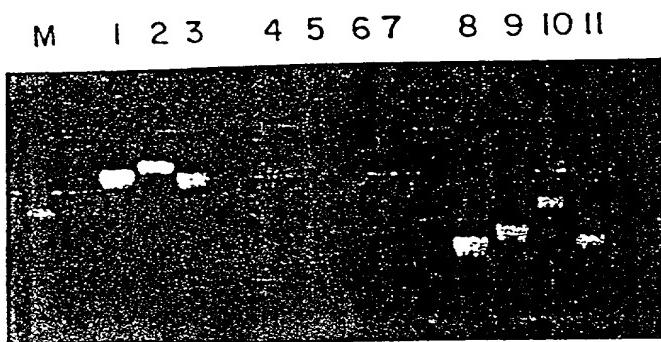
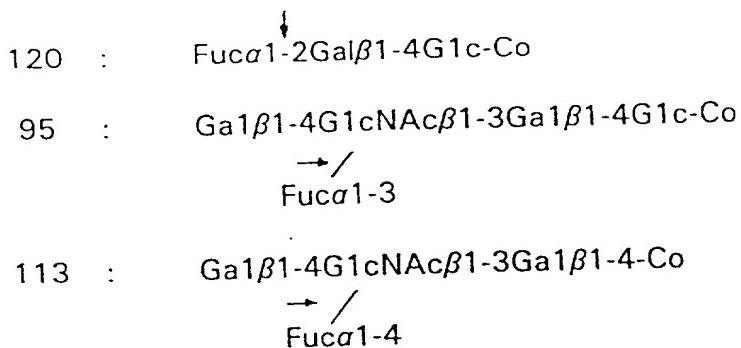
109 :  $\downarrow$   
 $\text{Ga1}\alpha\text{1-3Ga1}\beta\text{1-3G1cNAc-Co}$



Substrate 109

Lanes 1-4	=	complete digest
1	=	1 $\mu\text{l}$ . of $\alpha\text{1-3, 6 Galactosidase}$
2	=	0.5 $\mu\text{l}$ .
3	=	0.25 $\mu\text{l}$ . : concentration of enzyme-4 units/ $\mu\text{l}$ .
4	=	0.125 $\mu\text{l}$ .
5-8	=	partial digest
9-10	=	undigested

FIG. 3



## Substrate 120

- 1 + no enzyme
- 2 +  $\alpha$ -Fucosidase II
- 3 +  $\alpha$ -Fucosidase I

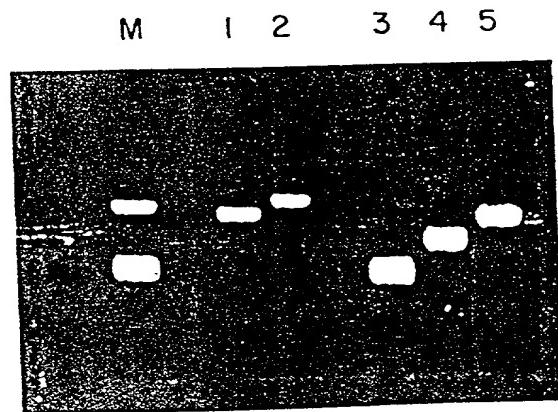
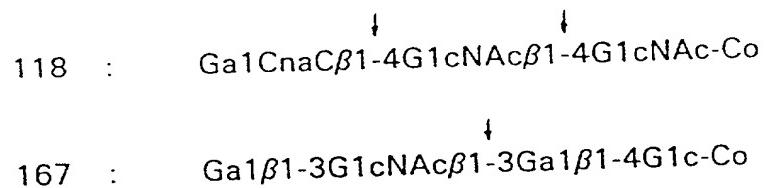
## Substrate 95

- 4 no enzyme
- 5 +  $\alpha$ -Fucosidase I
- 6 +  $\alpha$ -Fucosidase I +  $\beta$ -Galactosidase (bovine testes)
- 7 +  $\alpha$ -Fucosidase II

## Substrate 113

- 8 no enzyme
- 9 +  $\alpha$ -Fucosidase I
- 10 +  $\alpha$ -Fucosidase I +  $\beta$ -Galactosidase (bovine testes)
- 11 +  $\alpha$ -Fucosidase II

FIG. 4



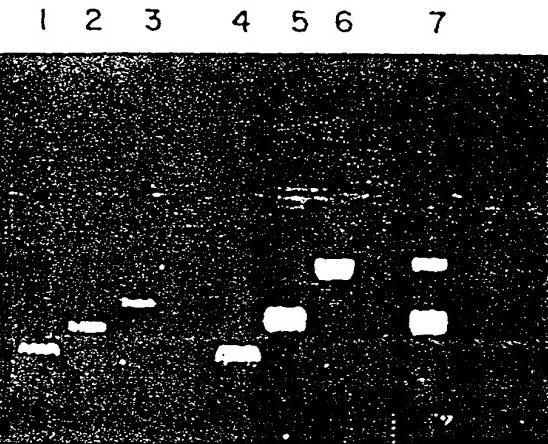
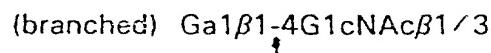
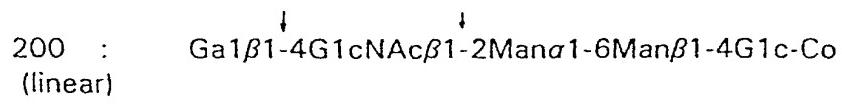
## Substrate 118

1	+	no enzyme
2	+	$\beta$ -GlcNAcase

## Substrate 167

3	+	no enzyme
4	+	$\beta$ -Galactosidase
5	+	$\beta$ -Galactosidase + $\beta$ -GlcNAcase

FIG. 5



#### Substrate 200

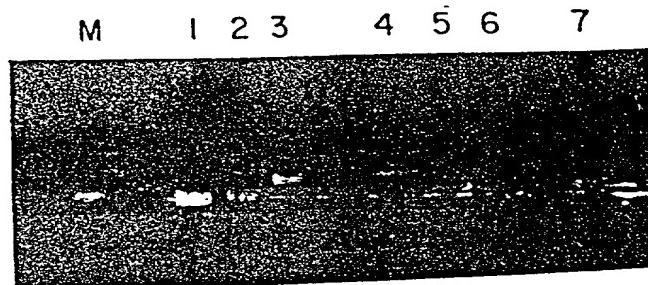
- |   |   |   |
|---|---|---|
| 1 | + | no enzyme   |
| 2 | + | $\beta$ -Galactosidase  |
| 3 | + | $\beta$ -Galactosidase + $\beta$ -GlcNAcase ( <u>X. manihotis</u> ) |

#### Substrate 197

- |   |   |   |
|---|---|---|
| 4 | + | no enzyme   |
| 5 | + | $\beta$ -Galactosidase  |
| 6 | + | $\beta$ -Galactosidase + $\beta$ -GlcNAcase ( <u>X. manihotis</u> ) |
| 7 | + | Marker (92b,167)  |

F I G. 6

96 :  $\text{Ga1NAc}\beta\text{1-3Ga1}\alpha\text{1-4Ga1}\beta\text{1-4G1c-Co}$   
 205 :  $\text{Ga1NAc}\beta\text{1-4Ga1}\beta\text{1-4G1c-Co}$



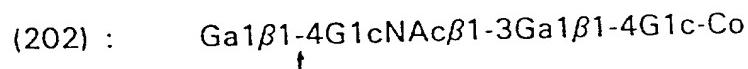
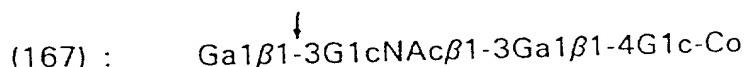
#### Substrate 96

- |   |   |  |
|---|---|--|
| 1 | + | no enzyme                                  |
| 2 | + | $\beta$ -GlcNAcase ( <u>X. manihotis</u> ) |
| 3 | + | $\beta$ -GlcNAcase (bovine kidney)         |

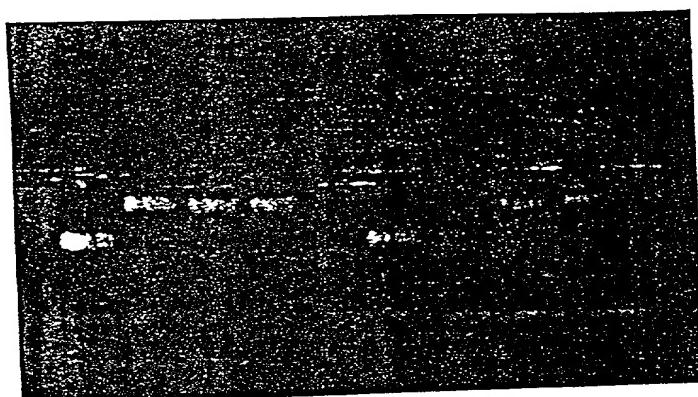
#### Substrate 205

- |   |   |  |
|---|---|--|
| 4 | + | no enzyme                                  |
| 5 | + | $\beta$ -GlcNAcase ( <u>X. manihotis</u> ) |
| 6 | + | $\beta$ -GlcNAcase (bovine kidney)         |
| 7 | + | Marker (92b,167)                           |

F I G. 7



1 2 3 4 5 6 7 8



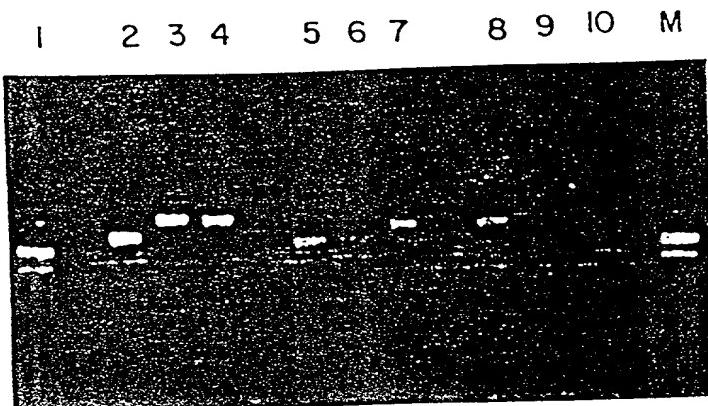
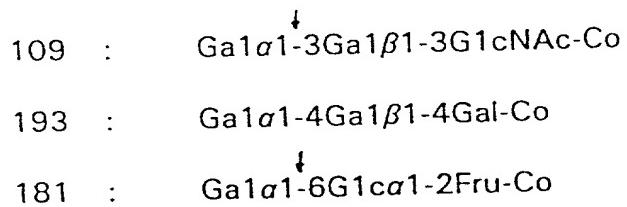
#### Substrate 167

- 1 + no enzyme
- 2 +  $\beta\text{1-3}>>4$  Galactosidase (*X. manihotis*) at 1x concentration
- 3 +  $\beta\text{1-3}, 4>6$  Galactosidase (bovine testes) at 1x concentration
- 4 +  $\beta\text{1-3}, 4$  Galactosidase (chicken liver) at 1x concentration

#### Substrate 202

- 5 + no enzyme
- 6 +  $\beta\text{1-3}>>4$  Galactosidase (*X. manihotis*) at 100x concentration
- 7 +  $\beta\text{1-3}, 4>6$  Galactosidase (bovine testes) at 1x concentration
- 8 +  $\beta\text{1-3}, 4$  Galactosidase (chicken liver) at 1x concentration

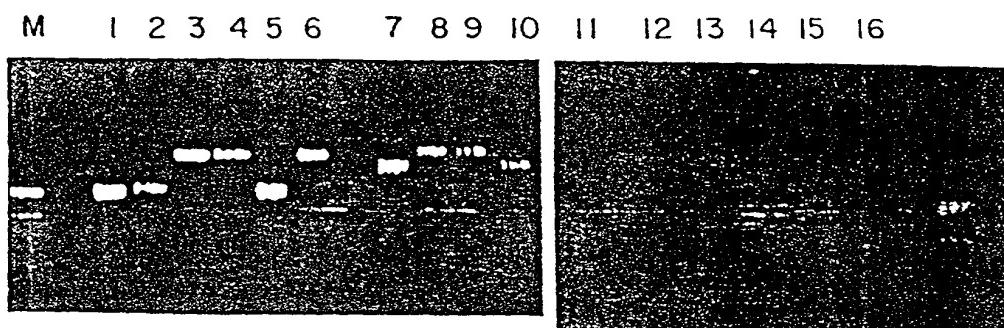
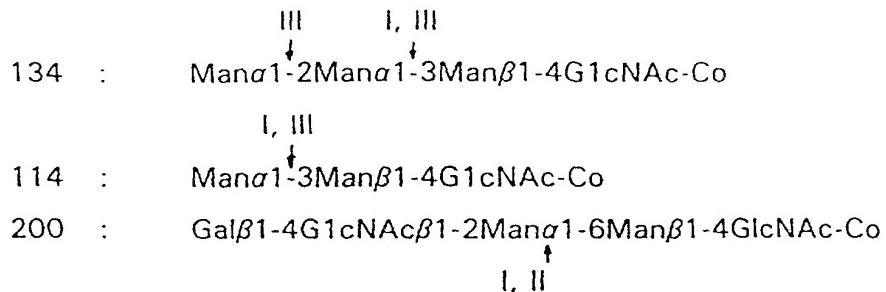
FIG. 8



1		Marker
		Substrate 109
2	+	no enzyme
3	+	$\alpha$ 1-3, 6 Galactosidase ( <i>X. manihotis</i> )
4	+	$\alpha$ 1-3, 4, 6 Galactosidase (coffee bean)
		Substrate 193
5	+	no enzyme
6	+	$\alpha$ 1-3, 6 Galactosidase ( <i>X. manihotis</i> )
7	+	$\alpha$ 1-3, 4, 6 Galactosidase (coffee bean)
		Substrate 181
8	+	no enzyme
9	+	$\alpha$ 1-3, 6 Galactosidase ( <i>X. manihotis</i> )
10	+	$\alpha$ 1-3, 4, 6 Galactosidase (coffee bean)

FIG. 9

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Substrate 134

- 1 + no enzyme  
 2 +  $\alpha$ -Mannosidase I (15 units, 20 hrs.)  
 3 +  $\alpha$ -Mannosidase III (15 units, 2 hrs.)  
 4 +  $\alpha$ -Mannosidase III (15 units, 20 hrs.)  
 5 +  $\alpha$ -Mannosidase II (100 units, 20 hrs.)  
 6 + Jack bean  $\alpha$ -Mannosidase

## Substrate 114

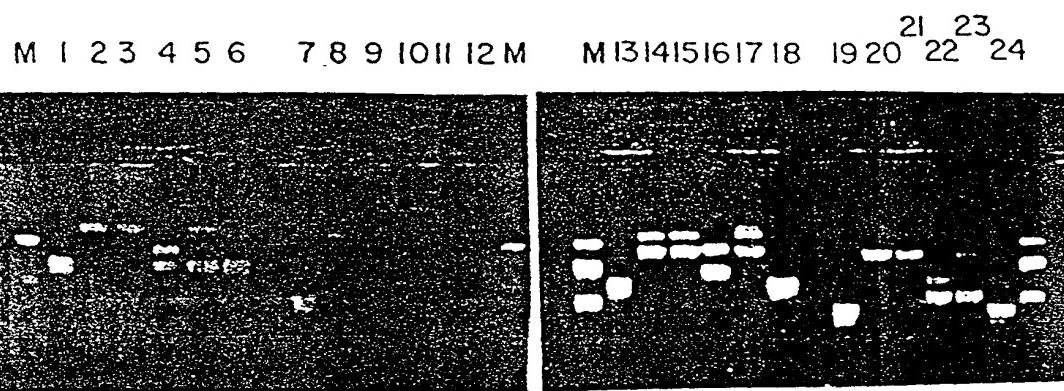
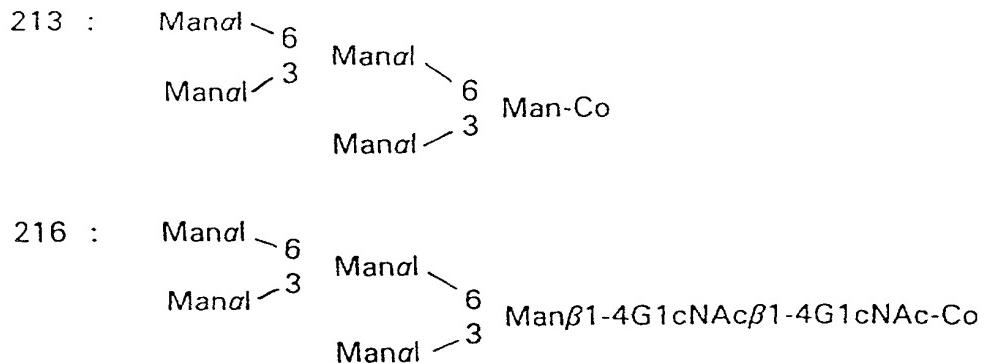
- |    |   |   |
|----|---|---|
| 7  | + | no enzyme                                     |
| 8  | + | $\alpha$ -Mannosidase I (15 units, 2 hrs.)    |
| 9  | + | $\alpha$ -Mannosidase III (15 units, 2 hrs.)  |
| 10 | + | $\alpha$ -Mannosidase III (15 units, 2 hrs.)  |
| 11 | + | $\alpha$ -Mannosidase II (100 units, 20 hrs.) |

### Substrate 200

- |    |   |   |      |
|----|---|---|------|
| 12 | + | no enzyme   |      |
| 13 | + | $\beta$ -Galactosidase (bovine testes <sup>OGS</sup> )                                    |      |
| 14 | + | $\beta$ -Galactosidase + $\beta$ -GlcNAcase   |      |
| 15 | + | $\beta$ -Galactosidase + $\beta$ -GlcNAcase + $\alpha$ -Mannosidase I<br>units, 2 hrs.)   | (15) |
| 16 | + | $\beta$ -Galactosidase + $\beta$ -GlcNAcase + $\alpha$ -Mannosidase III<br>units, 2 hrs.) | (15) |
| 17 | + | $\beta$ -Galactosidase + $\beta$ -GlcNAcase + $\alpha$ -Mannosidase II<br>units, 2 hrs.)  | (15) |

FIG. 10

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#### TWO-HOUR INCUBATION

Substrate 213  
 1 + no enzyme  
 2 +  $\alpha$ -Mannosidase I  
 3 +  $\alpha$ -Mannosidase I + II  
 4 +  $\alpha$ -Mannosidase III  
 5 +  $\alpha$ -Mannosidase II + III  
 6 +  $\alpha$ -Mannosidase II

Substrate 216  
 7 + no enzyme  
 8 +  $\alpha$ -Mannosidase I  
 9 +  $\alpha$ -Mannosidase I + II  
 10 +  $\alpha$ -Mannosidase III  
 11 +  $\alpha$ -Mannosidase II + III  
 12 +  $\alpha$ -Mannosidase II

#### TWENTY-HOUR INCUBATION

Substrate 213  
 13 + no enzyme  
 14 +  $\alpha$ -Mannosidase I  
 15 +  $\alpha$ -Mannosidase I + II  
 16 +  $\alpha$ -Mannosidase III  
 17 +  $\alpha$ -Mannosidase II + III  
 18 +  $\alpha$ -Mannosidase II

Substrate 216  
 19 + no enzyme  
 20 +  $\alpha$ -Mannosidase I  
 21 +  $\alpha$ -Mannosidase I + II  
 22 +  $\alpha$ -Mannosidase III  
 23 +  $\alpha$ -Mannosidase II + III  
 24 +  $\alpha$ -Mannosidase II

FIG. 11

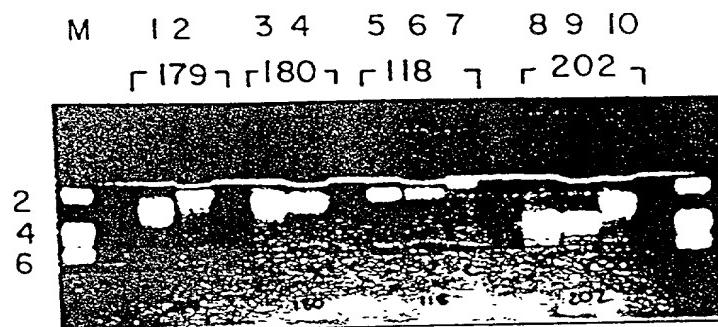
12/17

179 : Glc $\beta$ 1-4Glc $\beta$ 1-4Glc-Co

180 : Glc $\alpha$ 1-4Glc $\alpha$ 1-4Glc-Co

118 : GlcNAc $\beta$ 1-4GlcNAc $\beta$ 1-4GlcNAc-Co

202 : Gal $\beta$ 1-4GlcNAc $\beta$ 1-3Gal $\beta$ 1-4Glc-Co



M Marker

Substrate 179

1 + no enzyme  
2 +  $\beta$ Glucosidase (1 unit)

Substrate 180

3 + no enzyme  
4 +  $\beta$ Glucosidase (5 units)

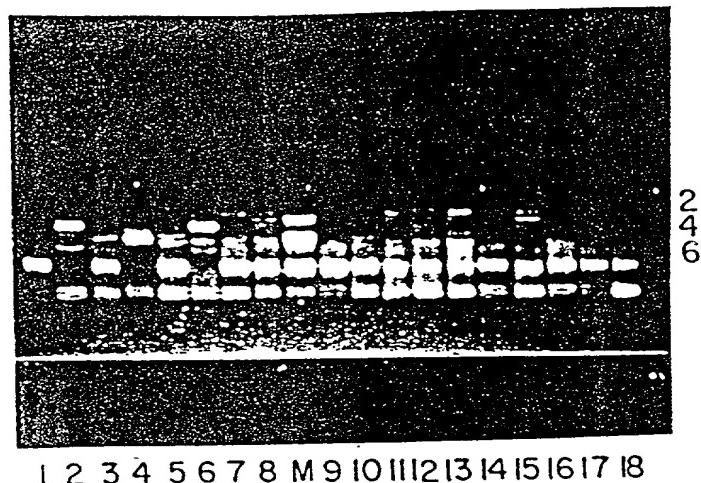
Substrate 118

5 + no enzyme  
6 +  $\beta$ Glucosidase (5 unit)  
7 +  $\beta$ GlcNAcase

Substrate 202

8 + no enzyme  
9 +  $\beta$ Glucosidase (5 units)  
10 +  $\beta$ Galactosidase

FIG. 12



Substrate: Gs 300

## Lane Nos.

1. No extract
2. *Xanthomonas holicicola* ATCC # 13461
3. *Xanthomonas badrii* ATCC # 11672
4. *Xanthomonas manihotis* ATCC # 49764
5. *Xanthomonas cyanopsidis* ATCC # 55472
6. *Xanthomonas oryzae* ATCC # 55470
7. *Xanthomonas campestris* ATCC # 55470
8. *Xanthomonas campestris*

M: Markers (92b, 167, 197)

9. No extract
10. *Bacillus globigii* I
11. *Bacillus globigii* II
12. *Bacillus caldolyticus*
13. *Bacillus brevis*
14. *Bacillus stearothermophilus* Strain A
15. *Bacillus stearothermophilus* Strain B
16. *Bacillus aneurinolyticus*
17. *Bacillus sphaericus*
18. *Bacillus stearothermophilus* Strain C

FIG. 13

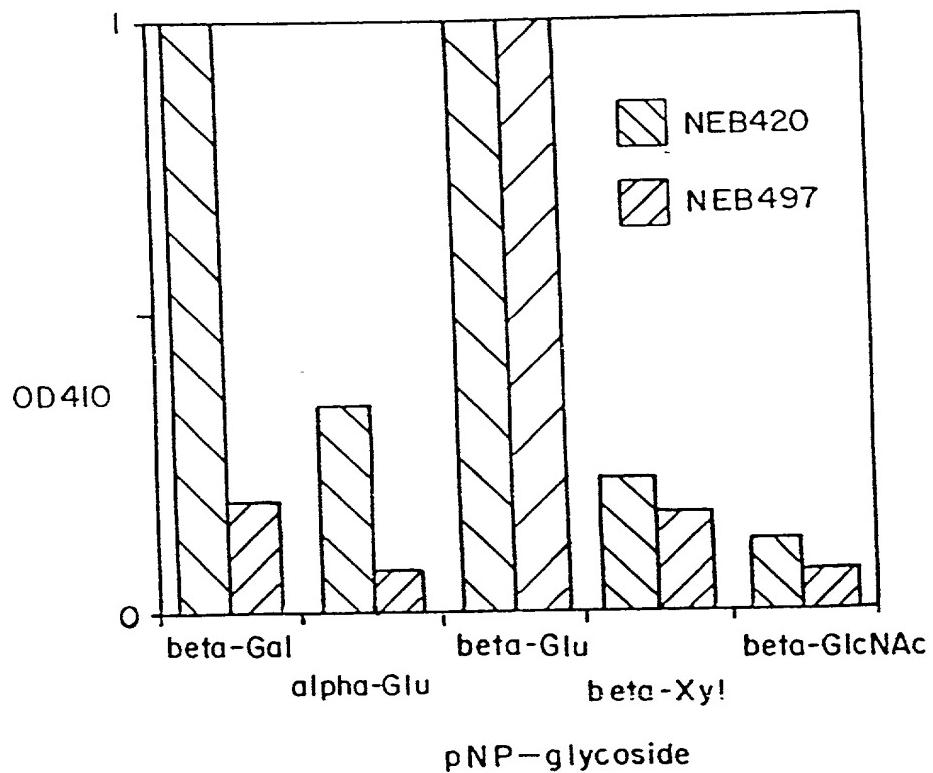
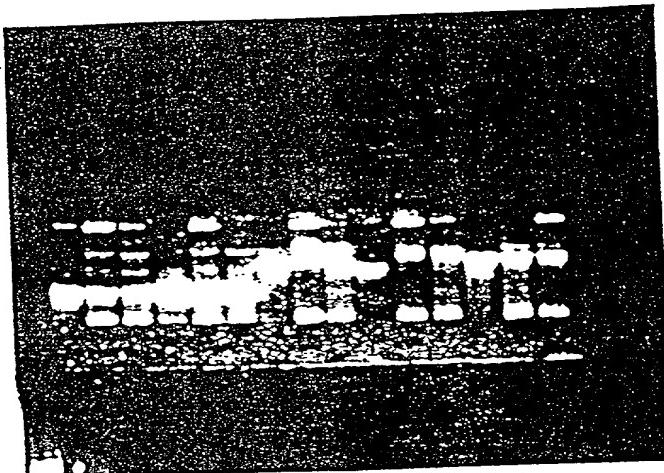


FIG. 14



## Substrate 202

- |                                  |         |
|----------------------------------|---------|
| 1. No extract                    |         |
| 2. <i>Xanthomonas campestris</i> | NEB 420 |
| 3. <i>Xanthomonas campestris</i> | NEB 497 |

## Substrate 167

- |                                  |         |
|----------------------------------|---------|
| 4. No extract                    |         |
| 5. <i>Xanthomonas campestris</i> | NEB 420 |
| 6. <i>Xanthomonas campestris</i> | NEB 497 |

## Substrate 180

- |                                  |         |
|----------------------------------|---------|
| 7. No extract                    |         |
| 8. <i>Xanthomonas campestris</i> | NEB 420 |
| 9. <i>Xanthomonas campestris</i> | NEB 497 |

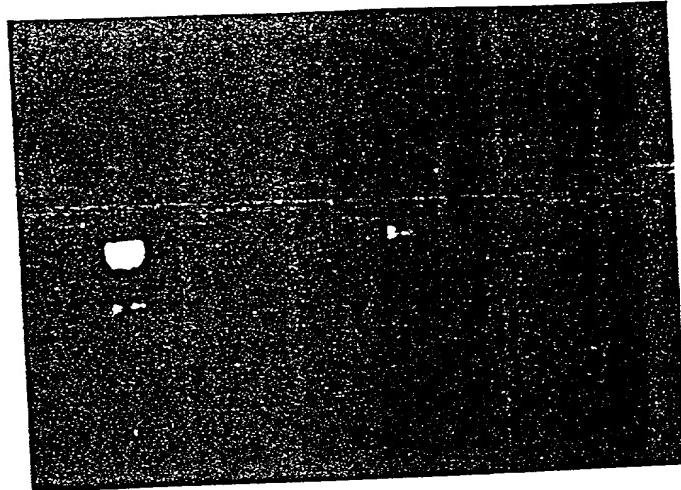
## Substrate 179

- |                                   |         |
|-----------------------------------|---------|
| 10. No extract                    |         |
| 11. <i>Xanthomonas campestris</i> | NEB 420 |
| 12. <i>Xanthomonas campestris</i> | NEB 497 |

## Substrate 233

- |                                   |         |
|-----------------------------------|---------|
| 13. No extract                    |         |
| 14. <i>Xanthomonas campestris</i> | NEB 420 |
| 15. <i>Xanthomonas campestris</i> | NEB 497 |

FIG. 15



M: Marker (191, 202)

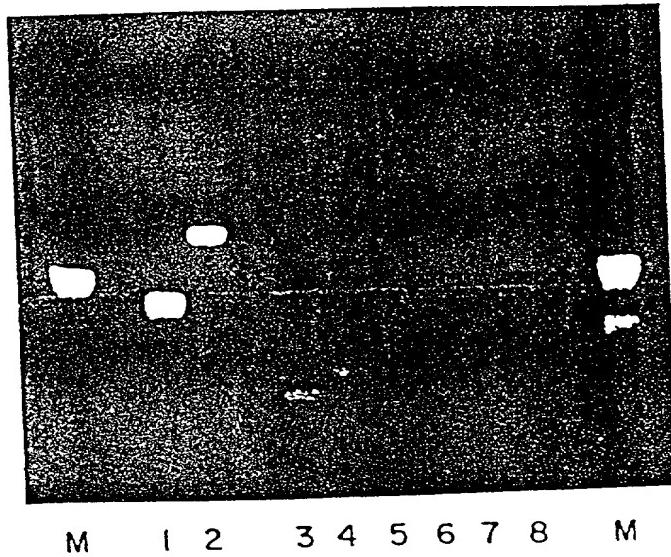
Substrate 300

1. No enzyme
2. 2 units  $\alpha$ 1-2, 3 Mannosidase (*Xanthomonas manihotis*)
3. 2 units  $\alpha$ 1-2, 3 Mannosidase + 5 units  $\beta$ -Xylosidase (*Xanthomonas holcicola*)
4. 5 units  $\beta$ -Xylosidase (*Xanthomonas holcicola*)

Substrate 264

1. No enzyme
2. 5 units  $\beta$ -Xylosidase (*Xanthomonas holcicola*)

F I G. 16



M: Marker (191, 202)

Substrate 259

1. No enzyme
2. 2.5 units  $\beta$ -Mannosidase

Substrate 300

3. No enzyme
4. 2 units  $\alpha$ 1-2, 3 Mannosidase (*Xanthomonas manihotis*)
5. 2 units  $\alpha$ 1-2, 3 Mannosidase + 2 units  $\beta$ -Xylosidase (*Xanthomonas holcicola*)
6. 2 units  $\alpha$ 1-2, 3 Mannosidase + 2 units  $\beta$ -Xylosidase + 10 units  $\alpha$ 1-6 Mannosidase (*Xanthomonas manihotis*)
7. 2 units  $\alpha$ 1-2, 3 Mannosidase + 2 units  $\beta$ -Xylosidase + 10 units  $\alpha$ 1-6 Mannosidase + 2.5 units  $\beta$ -Mannosidase (*Xanthomonas holcicola*)
8. 2.5 units  $\beta$ -Mannosidase (*Xanthomonas holcicola*)

FIG. 17